

The invention claimed is:

1. A process for reducing the organic sulfur content of a full boiling range cracked naphtha stream containing olefins, diolefins, mercaptans, thiophenes, and other organic sulfur compounds, comprising the steps of:

(a) separating the full boiling range cracked naphtha stream into three fractions comprising a light cracked naphtha fraction, an intermediate cracked naphtha fraction and a heavy cracked naphtha;

(b) subjecting the heavy cracked naphtha to hydrodesulfurization in a first hydrodesulfurization reactor containing a hydrodesulfurization catalyst; and

(c) combining the effluent from the first hydrodesulfurization reactor with the intermediate cracked naphtha and subjecting the combined stream to hydrodesulfurization in a second hydrodesulfurization reactor.

2. The process according to claim 1 wherein said light cracked naphtha contains substantially all of the mercaptans and is subjected to a wet caustic wash process wherein the mercaptans contained therein are converted to sulfides and said sulfides are removed.

3. The process according to claim 1 wherein said intermediate cracked naphtha contains mercaptans and substantially all of the thiophenes and substantially all of said mercaptans and thiophenes are converted to hydrogen sulfide in said second hydrodesulfurization reactor.

4. The process according to claim 1 wherein said heavy cracked naphtha contains thiophenes and substantially all of said other organic sulfur compounds and a portion of said thiophenes and other organic sulfur compounds are converted to hydrogen sulfide in said first hydrodesulfurization reactor.

5. The process according to claim 4 wherein substantially all of the remaining thiophenes and other organic sulfur compounds are converted to hydrogen sulfide in said second hydrodesulfurization reactor.

6. The process according to claim 1 wherein said full boiling range cracked naphtha stream is first subjected to thioetherification in a thioetherification reactor prior to separating the full boiling range cracked naphtha stream into said three fractions, wherein substantially all of said mercaptans are reacted with a portion of said diolefins to form sulfides.

7. The process according to claim 6 wherein said sulfides are removed in said heavy cracked naphtha and substantially all of said sulfides are converted to hydrogen sulfide in said first hydrodesulfurization reactor.

8. The process according to claim 7 wherein the remaining sulfides are converted to hydrogen sulfide in said second hydrodesulfurization reactor.

9. The process according to claim 1 wherein said light cracked naphtha fraction boils in the range of C_5 to about 150°F, said intermediate cracked naphtha fraction boils in the range of about 150 to about 250°F and said heavy cracked naphtha boils in the range of about 250 to 450°F.

10. A process for reducing the organic sulfur content of a full boiling range cracked naphtha stream containing olefins, diolefins, mercaptans, thiophenes, and other organic sulfur compounds, comprising the steps of:

(a) subjecting the full boiling range naphtha to thioetherification in a thioetherification reactor wherein substantially all of said mercaptans are reacted with a portion of said diolefins to form sulfides;

(b) separating the effluent from the thioetherification reactor into three fractions comprising a light cracked naphtha fraction boiling in the range of C_5 to about 150°F, an intermediate cracked naphtha fraction boiling in the range of about 150 to about 250°F and a heavy cracked naphtha boiling in the range of about 250 to 450°F;

(b) subjecting the heaving cracked naphtha to hydrodesulfurization in a first hydrodesulfurization reactor containing a hydrodesulfurization catalyst; and

(c) combining the effluent from the first hydrodesulfurization reactor with the intermediate cracked naphtha and subjecting the combined stream to hydrodesulfurization in a second hydrodesulfurization reactor.

11. A process for reducing the organic sulfur content of a full boiling range cracked naphtha stream containing olefins, diolefins, mercaptans, thiophenes, and other organic sulfur compounds, comprising the steps of:

(a) separating the full boiling range cracked naphtha stream into three fractions comprising a light cracked naphtha fraction boiling in the range of C_5 to about 150°F, an intermediate cracked naphtha fraction boiling in the range of about 150 to about 250°F and a heavy cracked naphtha boiling in the range of about 250

to 450°F;

(b) subjecting the heaving cracked naphtha to hydrodesulfurization in a first hydrodesulfurization reactor containing a hydrodesulfurization catalyst;

(c) combining the effluent from the first hydrodesulfurization reactor with the intermediate cracked naphtha and subjecting the combined stream to hydrodesulfurization in a second hydrodesulfurization reactor and

(d) subjecting said light cracked naphtha to a wet caustic wash wherein substantially all of the mercaptans contained therein are converted to sulfides.

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